

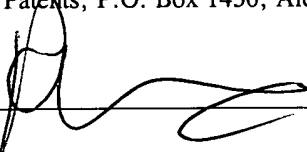
**APPARATUS FOR TREATING AMMONIATED MEATS**

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1                   **APPARATUS FOR TREATING**  
2                   **AMMONIATED MEATS**

3  
4                   CROSS-REFERENCE TO RELATED APPLICATIONS

5                   This application is a continuation application of United States Patent Application No.  
6                   10/173,955, filed June 18, 2002, entitled "APPARATUS AND METHOD FOR EXPOSING  
7                   COMMUNUTED FOODSTUFF TO A PROCESSING FLUID", which is a continuation-in-part  
8                   application of United States Patent Application No. 09/579,783, filed May 26, 2000, entitled  
9                   "METHOD FOR TREATING AMMONIATED MEATS," now United States Patent No.  
10                  6,406,728, which is a divisional application of United States Patent Application No. 09/286,699,  
11                  filed April 6, 1999, entitled "APPARATUS FOR TREATING AMMONIATED MEATS," now  
12                  United States Patent No. 6,142,067. The entire contents of the disclosure in United States Patent  
13                  No. 6,142,067 are hereby incorporated herein by this reference.

14  
15                  TECHNICAL FIELD OF THE INVENTION

16                  The invention relates to meat processing and, more particularly, to an apparatus for  
17                  improving the quality of meats which have been exposed to ammonia.

18  
19                  BACKGROUND OF THE INVENTION

20                  Meat is inevitably exposed to microbes as the material is processed or handled.  
21                  Microbes are part of the natural decay process of organic material and are commonly deposited

1 on meat by contact between the meat and contaminated equipment or other material. Microbes  
2 may also be airborne. Although some microbes may be relatively benign, others contribute to  
3 spoilage and some can cause serious illness. Lactic acid producing bacteria are examples of  
4 benign microbes, while some strains of E. Coli, Salmonella, Listeria, and Staph bacteria are  
5 examples of pathogenic microbes which can cause serious illness when ingested by humans.

6 Even with careful processing practices, meat may be exposed to pathogenic microbes  
7 during processing or initial handling. However, the risk of illness from dangerous microbes  
8 which may be present in meat is reduced by careful handling and cooking. In larger cuts of  
9 meat for example, dangerous microbes may only be present on the surface of the meat and are  
10 readily killed in the cooking process.

11 Comminuted and mixed meats, including ground beef, require more thorough cooking  
12 in order to kill dangerous microbes which may be present in the material. The reason for this  
13 is that dangerous microbes residing at the surface of a larger piece of meat may be distributed  
14 throughout the final comminuted product as the large piece is ground or otherwise cut into  
15 smaller pieces and mixed with other pieces. Thorough cooking is required in order to kill  
16 microbes residing in the center of a mass of comminuted meat.

17 Even though the risk from microbes residing in meat is reduced by proper cooking, it is  
18 desirable to control the growth of pathogenic microbes and reduce pathogenic microbe content  
19 in meat. Various methods have been developed for improving the quality of meat by reducing  
20 or controlling pathogenic microbe content in the material. U.S. Patent No. 5,871,795, to the  
21 inventor of the present invention, discloses a method using ammonia to modify the pH of meat.

1 The ammonia treatment disclosed in U.S. Patent No. 5,871,795 has been shown to decrease  
2 pathogenic microbe content in meat, and to inhibit pathogenic microbe growth after treatment.

3 While the ammoniated (ammonia treated) meat does exhibit decreased pathogenic  
4 microbe content, excessive ammonia exposure may have adverse effects on the product. For  
5 example, portions of the meat being treated may be overexposed to ammonia while other  
6 portions of the meat may be exposed to very little or none of the ammonia. The overexposed  
7 portions may absorb sufficient ammonia to affect the taste of the meat and to produce a  
8 residual ammonia odor. Underexposed portions of the meat may not exhibit the desired  
9 pathogenic microbe inhibiting effect.

#### 11 SUMMARY OF THE INVENTION

12 It is an object of the invention to provide an apparatus for improving the quality of  
13 ammoniated meats. More particularly, it is an object of the invention to provide an apparatus  
14 for ensuring a more even pH increase throughout an ammoniated, comminuted meat.

15 The method according to the invention includes exposing at least a portion of a quantity  
16 of comminuted meat to ammonia. After exposing at least a portion of the comminuted meat to  
17 ammonia, the meat is further comminuted. Further comminuting the meat after ammonia  
18 exposure produces a meat having much more even ammonia distribution. This more even  
19 distribution eliminates residual ammonia odor and produces a consistently better tasting  
20 comminuted meat. Also, it is believed that the evenly distributed ammonia produces a more  
21 consistent microbe inhibiting effect throughout the volume of the further comminuted meat.

1           Meats which may be treated according to the invention include beef, pork, lamb, and  
2   other red meats. Also, for purposes of this disclosure and the following claims "meat" may  
3   comprise or include poultry or seafood. The invention is not limited to any particular fat  
4   content in the meat being treated. However, fat content may affect the amount of ammonia  
5   which may be added to the original or initial comminuted meat. Also, the meat being treated  
6   may include various additives or fillers which are added either before or after the ammonia  
7   exposure.

8           As used in this disclosure and the following claims, a "comminuted" material comprises  
9   generally a material which has been cut into relatively smaller pieces from one or more  
10   relatively larger pieces. The meat being treated may be originally comminuted by any suitable  
11   device such as grinder or bowl chopper. Regardless of the manner in which the original or  
12   initial material is comminuted, the size of the individual pieces in the initial comminuted meat  
13   may preferably have a maximum dimension of between two (2) inches and three-eighths (3/8)  
14   of an inch.

15          The step of further comminuting the meat after exposure to ammonia is preferably  
16   performed with a grinder, but may be performed with any suitable comminuting device such as  
17   a bowl chopper, for example. The maximum dimension of the individual pieces in the further  
18   comminuted meat may preferably be no greater than three-sixteenths (3/16) of an inch.

19          The step of exposing the comminuted meat to ammonia may be performed with any  
20   suitable ammonia contacting device or arrangement. For example, a pump-type device such as  
21   that shown in U.S. Patent No. 5,871,795 may be used to perform the ammonia exposing step  
22   according to the invention. In this pump-type device, ammonia gas is injected or otherwise

1 directed into the pump cylinder along with the meat to be treated. The ammonia is then  
2 compressed and pumped together with the meat into a conduit which carries the ammoniated  
3 meat to further processing equipment. In this arrangement the pump cylinder or other  
4 container where ammonia is injected represents a contact container.

5 In the preferred form of the invention, however, the ammonia contacting arrangement  
6 includes an elongated contacting or contact conduit having a chamber mounted in its interior.  
7 In this arrangement the contact conduit represents a contact container. The chamber includes a  
8 number of openings which extend from an interior area of the chamber to the interior of the  
9 contacting conduit. The openings represent pH increasing material inlets in the contact  
10 container. Also, the chamber includes an ammonia supply tube which supplies ammonia to the  
11 interior area of the chamber. The annular area between the chamber and the inner wall of the  
12 contacting conduit preferably has a dimension no greater than the maximum dimension of the  
13 pieces of original or initial comminuted meat being treated. In one preferred form of the  
14 invention, the distance between the inner wall of the contact conduit and the outer surface of  
15 the chamber is between one-half (1/2) of an inch and one-eighth (1/8) of an inch.

16 These and other objects, advantages, and features of the invention will be apparent  
17 from the following description of the preferred embodiments, considered along with the  
18 accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a somewhat diagrammatic side view of a treatment apparatus embodying the principles of the invention, partially broken away to show the ammonia contacting arrangement.

Figure 2 is an enlarged longitudinal section view through the ammonia contacting arrangement shown in Figure 1.

Figure 3 is an enlarged, longitudinal section view through a portion of the ammonia contacting arrangement shown in Figure 1.

## DESCRIPTION OF PREFERRED EMBODIMENTS

Figures 1 through 3 illustrate one preferred form of treatment apparatus 10 embodying the principles of the invention. Treatment apparatus 10 includes an initial comminuting device 11 and a further comminuting device 12. Also, treatment apparatus 10 includes a displacement device or pump 14 and an ammonia contacting arrangement shown generally at reference numeral 15.

Both of the comminuting devices 11 and 12 in this form of the invention comprise grinders such as the Model No. 1109 grinder by Weiler & Company, Inc. Although not shown in the drawings, each grinder 11 and 12 includes an auger which is driven by a suitable motor to force material against a grinder plate having a plurality of grinder openings. The end of the auger adjacent to the grinder plate includes one or more blades which each pass over the surface of the grinder plate to cut material which has entered the grinder plate openings. These

1 smaller pieces of material which have been cut as the grinder blades pass over the grinder plate  
2 are eventually displaced through the respective grinder plate openings and exit the grinder.

3 Grinder 11 receives relatively large pieces of meat 20 and produces the initial or  
4 original comminuted meat 21. In one form of the invention, the grinder plate associated with  
5 grinder 11 includes openings having a maximum dimension preferably between two (2) inches  
6 and three-eighths (3/8) of an inch. In a more preferred form of the invention, the grinder plate  
7 openings in grinder 11 have a maximum dimension of between one-half (1/2) of an inch to  
8 three-eighths (3/8) of an inch. The maximum dimension of the openings in the grinder plate  
9 generally determines the maximum dimension of the individual pieces of comminuted material  
10 exiting the grinder.

11 It will be appreciated that the original comminuted product 21 exiting grinder 11 is  
12 made up of a plurality of discrete pieces arranged together in a continuous mass. Individual  
13 pieces are represented in the drawings at reference numeral 25. Since these individual pieces  
14 are mixed together with other discrete pieces they are not necessarily visible individually from  
15 the collective mass of material. However, the discrete pieces 25 are shown for purposes of  
16 explaining the operation of the invention.

17 Grinder 12 receives the original comminuted meat after the material has been exposed  
18 to ammonia in the ammonia contacting arrangement 15. Preferably, grinder 12 further  
19 comminutes the initial comminuted material and includes a grinder plate having openings  
20 smaller than the openings in the grinder plate associated with grinder 11. Grinder 12 may  
21 include a grinder plate having openings with a maximum dimension of no greater than three-  
22 sixteenths (3/16) of an inch and preferably about one-eighth (1/8) of an inch. Alternatively,



1 the grinder plate associated with grinder 12 may have the same size openings as grinder 11 and  
2 still perform some comminuting within the scope of the invention. In any event, the further  
3 comminuted material 22 exits grinder 12 and is collected for packaging or for transport to  
4 further processing equipment. Figure 1 shows the further comminuted material 22 being  
5 collected in a receiving tub 23.

6 In the form of the invention shown in Figure 1, displacement device 14 comprises a  
7 suitable positive displacement metering device. Displacement device 14 collects the initial  
8 comminuted meat 21 in collection chute 27 and then displaces the initial comminuted meat  
9 through the ammonia contacting arrangement 15 as indicated by the flow direction shown at  
10 arrow F. Other forms of the invention may use other means for forcing the comminuted meat  
11 into and through the ammonia contacting arrangement 15. The particular displacement or  
12 pumping device will include a motor for driving the device with sufficient power to force the  
13 comminuted meat through the ammonia contacting arrangement 15.

14 Figures 2 and 3 show further details of the ammonia contacting arrangement 15 shown  
15 in Figure 1. The arrangement 15 includes a contact conduit 30 which forms a contact  
16 container having a chamber 31 positioned therein. The illustrated form of the invention shows  
17 chamber 31 positioned coaxially within contact conduit 30, although the chamber may be  
18 mounted eccentrically in the contacting conduit within the scope of the invention. As shown  
19 best in Figure 3, the coaxial arrangement leaves a uniform annular space 32 between the inner  
20 wall 34 of the contacting conduit 30 and the outer surface 35 of chamber 31. Chamber 31 also  
21 includes an interior area 36 and a plurality of openings 38 which extend from the chamber  
22 interior area to the annular space 32 between the contacting conduit inner wall 34 and the

1 chamber outer surface 35. The openings may be one thousandth of an inch in diameter or  
2 greater. Finally, the ammonia contacting arrangement 15 includes a supply tube 39 which is  
3 connected to feed ammonia from a supply 40 to the chamber interior area 36.

4 The form of the chamber 31 illustrated in the figures includes openings 38 which have  
5 been drilled or otherwise machined through the chamber wall. Other forms of the invention  
6 may include a chamber having walls made of a sintered material. The sintered walls in this  
7 preferred form of the invention are permeable to the ammoniating material.

8 In still other forms of the invention, the contacting conduit wall may include machined  
9 openings or sections of sintered material. An annular supply chamber may be located around  
10 the contact conduit or contact container for containing an ammoniating material. This  
11 additional ammonia contacting arrangement may be used instead of, or in addition to, the inner  
12 chamber form of the invention which uses chamber 31 shown in the figures.

13 Where the invention employs an inner chamber such as chamber 31, the distance  
14 between the contacting conduit inner wall 34 and the chamber outer surface 35 may be any  
15 distance which will allow the initial comminuted meat 21 to be displaced through the annulus  
16 without substantially damaging the meat. For example, the width of the annulus may be  
17 around two inches. A preferred width of the annulus is between one-half (1/2) to one-eighth  
18 (1/8) of an inch.

19 The treatment process according to the invention may now be described with reference  
20 to Figures 1 through 3. Referring to Figure 1, meat 20 is ground or otherwise comminuted to  
21 form the initial comminuted meat 21. This comminuted meat is collected in displacement  
22 device chute 27 and forced by displacement device 14 through the ammonia contacting

1 arrangement 15. In the ammonia contacting arrangement 15, at least a portion of the  
2 comminuted meat 21 is exposed to ammonia (ammoniated). The ammoniated meat passes from  
3 the ammonia contacting arrangement to grinder 12 where the material is preferably further  
4 comminuted. The further comminuted meat 22 is expelled from device 12 and collected for  
5 packaging or for further processing.

6 In the ammonia contacting arrangement 15 shown in the figures, an individual layer of  
7 comminuted meat pieces 25 passes through the annular space 32. The pieces 25 are exposed  
8 to ammonia on at least one surface as that surface passes over an opening 38 in chamber 31.  
9 Also, some ammonia may flow from chamber 31 into the comminuted material as it passes.  
10 The ammonia in chamber 31 may be in a gaseous form or may be in a solution with water.  
11 That is, may be an ammonia-based pH increasing material. Other ammoniating materials may  
12 be used instead of gaseous or aqueous ammonia. In any event, the pressure in chamber 31 is  
13 controlled so that the pH of the further comminuted meat 22 is at least about 6.0, or in the  
14 range from 6.0 to 11.0. According to the invention, the pH of the further comminuted  
15 material 22 is substantially consistent throughout the mass of material and is not subject to  
16 significant variation throughout the material.

17 The meat may be processed according to the invention in a wide temperature range.  
18 For example, the meat may be maintained at a temperature above 32°F for both the ammonia  
19 contacting step and the further comminuting step. In any event, the meat temperature should  
20 be high enough that some liquid component remains in the meat during the further  
21 comminuting step.

1           The above described preferred embodiments are intended to illustrate the principles of  
2           the invention, but not to limit the scope of the invention. Various other embodiments and  
3           modifications to these preferred embodiments may be made by those skilled in the art without  
4           departing from the scope of the following claims. For example, alternate forms of the  
5           invention may include different types of comminuting devices such as bowl choppers.  
6           Furthermore, the original comminuting step need not be performed in connection with the  
7           ammonia contacting and further comminuting steps, and may be performed by suitable means  
8           located at a different site. Also, alternate forms of the invention may use a pump-type  
9           ammonia contacting arrangement such as the arrangement described in U.S. Patent No.  
10          5,871,795. The pump-type arrangement may be used to perform the function of the  
11          displacement device 14 and ammonia contacting arrangement 15 shown in the illustrated form  
12          of the invention.